# (19) World Intellectual Property Organization

International Bureau





(43) International Publication Date 15 July 2004 (15.07.2004)

**PCT** 

(10) International Publication Number WO 2004/059348 A3

(51) International Patent Classification7:

G02B 3/00

(21) International Application Number:

PCT/US2003/040033

(22) International Filing Date:

16 December 2003 (16.12.2003)

(25) Filing Language:

**English** 

(26) Publication Language:

English

(30) Priority Data:

364198/2002

16 December 2002 (16.12.2002) JP

(71) Applicant (for all designated States except US): 3M IN-NOVATIVE PROPERTIES COMPANY [US/US]; 3M Center, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): MORISHITA, Kenichiro [JP/JP]; 2-5-10-101 Aihara, Sagamihara, Kanagawa 229-1101 (JP). SANO, Koichi [JP/JP]; 4524-15 Kamimizo, Sagamihara, Kanagawa 229-1123 (JP). (74) Agents: BUCKINGHAM, Stephen W., et al.; Office of Intellectual Property Counsel, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

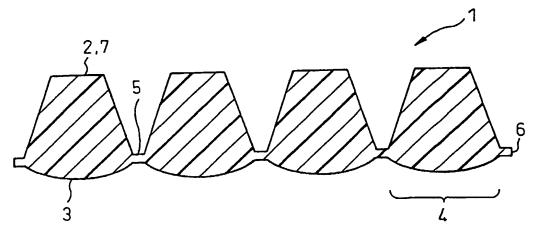
#### Published:

with international search report

(88) Date of publication of the international search report: 21 October 2004

[Continued on next page]

(54) Title: LENS ARRAY SHEET AND MOLDING METHOD



(57) Abstract: To provide a lens array sheet (1) capable of efficiently condensing diffuse light such as the light from a LED light source or EL light source. The lens array sheet comprises a transparent base material (6), a plurality of light-receiving sections each consisting of a transparent right frustum (2) which is provided on the surface of the base material and is tapered outwardly from the base material, and a plurality of condensing lenses (3) disposed on the back of the base material so as to face the respective light-receiving sections. The side face of the right frustum (2) forms a taper angle larger than 0° and less than 15° with the central axial line of the right frustum, and an aspect ratio (H/D) which is a proportion of the height (H) of the right frustum to the minimum length (D) of the cut surface of the right frustum is larger than 0, and no more than 10.







For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

International Application No BO US 03/40033

A. CLASSIFICATION OF SUBJECT MAIL PC 7 G02B3/00

According to International Pater	t Classification (IPC	C) or to both nation	al classification and IPC
----------------------------------	-----------------------	----------------------	---------------------------

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 GO2B

Documentation searched other than minimum documentation to the extent that such documents are included. In the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, INSPEC, COMPENDEX

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to daim No.
X A	US 5 521 725 A (ZIMMERMAN SCOTT M ET AL) 28 May 1996 (1996-05-28)  column 4, line 59 - column 5, line 22 column 6, lines 18-30 column 6, line 47 - column 7, line 36	1-8 9
Ą	figures 2A,7  US 5 949 933 A (BEESON KARL W ET AL) 7 September 1999 (1999-09-07) column 4, lines 18,33 column 5, lines 1-36 figure 6	1–9
	-/	

Further documents are listed in the continuation of box C.	X Patent family members are listed in annex.
<ul> <li>Special categories of cited documents:</li> <li>"A" document defining the general state of the art which is not considered to be of particular relevance</li> <li>"E" earlier document but published on or after the international filing date</li> <li>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</li> <li>"O" document referring to an oral disclosure, use, exhibition or other means</li> <li>"P" document published prior to the international filing date but later than the priority date claimed</li> </ul>	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combined with one or more other such documents, such combination being obvious to a person skilled in the art.  "&" document member of the same patent family
Date of the actual completion of the international search  26 July 2004	Date of mailing of the international search report 03/08/2004
Name and mailing address of the ISA  European Patent Office, P.B. 5818 Patentlaan 2  NL - 2280 HV Rijswijk  Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  Fax: (+31-70) 340-3016	Authorized officer  Verdrager, V

Integrational Application No RC US 03/40033

C.(Continu	ation) DOCUMENTS CONSIDER TO BE RELEVANT	
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 09, 31 July 1998 (1998-07-31) -& JP 10 104405 A (SONY CORP), 24 April 1998 (1998-04-24) abstract paragraphs '0022!, '0030!, '0036! - '0046! figures 7,8,10	1,9
A	EP 1 014 114 A (SEIKO EPSON CORP) 28 June 2000 (2000-06-28) paragraph '0052! figure 7	1,9
A	US 5 839 823 A (KUPER JERRY WAYNE ET AL) 24 November 1998 (1998-11-24) column 3, paragraph 14-34 figures 6-12,33	1,3
X	WO 02/43937 A (WESSLING MATTHIAS; NIJDAM WIETZE (NL); VOGELAAR LAURA (NL); AQUAMARIJ) 6 June 2002 (2002-06-06)	9,11
A	page 9, lines 21-27 page 14, line 45 - page 15, line 12 page 33, lines 48-54	10,12,13
А	PATENT ABSTRACTS OF JAPAN vol. 0122, no. 43 (P-728), 9 July 1988 (1988-07-09) & JP 63 034501 A (CANON INC), 15 February 1988 (1988-02-15) abstract	9,11,12
	PATENT ABSTRACTS OF JAPAN vol. 0132, no. 76 (P-890), 26 June 1989 (1989-06-26) & JP 01 065502 A (CANON INC), 10 March 1989 (1989-03-10) abstract	9,11,12

International Application No Post US 03/40033

			<del></del>				03/40033
	tent document in search report		Publication date		Patent family member(s)		Publication date
US	5521725	A	28-05-1996	US	5428468	A	27-06-1995
-				ÜS	5396350		07-03-1995
				AU	4523496		24-07-1996
				DE	69508283	D1	15-04-1999
				DE	69508283	T2	19-08-1999
				EP	0801717		22-10-1997
				JР		T	10-11-1998
				JP	3532215	B2	31-05-2004
				WO	9621122		11-07-1996
				AU	2280295		05-12-1995
				CA	2190122	A1	23-11-1995
				CN	1148428		23-04-1997
				DE	69507456		04-03-1999
				DE	69507456		15-07-1999
				EP	0749550		27-12-1996
				JP	3488467		19-01-2004
	٠			JP	10500528		13-01-1998
				WO	9531672		23-11-1995
				US	5555329		10-09-1996
				US	5555109		10-09-1996
				US	5739931		14-04-1998
				US	5761355		02-06-1998
		•		US	5748828		05-05-1998
				US	6129439		10-10-2000
		•		AT	180322		15-06-1999
	•			ΑÙ	1087795		23-05-1995
				CA	2174528		11-05-1995
		•		CN	1136349		20-11-1996
				DE	69418617		24-06-1999
				DE	69418617		03-02-2000
				DK	727028		08-11-1999
				EP	0727028		21-08-1996
				ËS	2132597		16-08-1999
				FI	961880		03-05-1996
				GR	3030897		30-11-1999
		•		JP	2706574		28-01-1998
				JP	8511129		19-11-1996
				SG	47942		17-04-1998
			•				
				WO 	9512782 		11-05-1995
US	5949933	Α	07-09-1999	AU	2977999		20-09-1999
				CA	2322326		10-09-1999
				DE	69917232		17-06-2004
				EP	1060344		20-12-2000
				JP	2002506268		26-02-2002
				WO	9945317	A1	10-09-1999
JP	10104405	Α	24-04-1998	NONE	···		
EP	1014114	Α	28-06-2000	JP	2000035504		02-02-2000
				EP	1014114		28-06-2000
				US	6623999		23-09-2003
				CN	1269018		04-10-2000
				WO	9959004		18-11-1999
			•	TW	416008		21-12-2000
				US	2003207484	A1	06-11-2003
	5839823	A	24-11-1998	AT	209768	т	15-12-2001

International Application No Page US 03/40033

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 5839823	Α	<u> </u>	CA	2250312	A1	02-10-1997
			CN	1220002	A,B	16-06-1999
			DE	69708615	D1	10-01-2002
			DE	69708615		01-08-2002
			DK	890060		18-02-2002
			EP	0890060		13-01-1999
			ES	2169374		01-07-2002
			JP	E000007700	Ţ	20-06-2000
			KR		A	25-01-2000
			PT		T	29-04-2002
			TW	419572		21-01-2001
			WO	9736131		02-10-1997
WO 0243937	Α	06-06-2002	NL	1016779		04-06-2002
			AU	1970402		11-06-2002
			EP	1341655		10-09-2003
			WO	0243937		06-06-2002
			US	2004028875	A1 .	12-02-2004
JP 63034501	Α	15-02-1988	NONE			
JP 01065502	Α	10-03-1989	NONE			